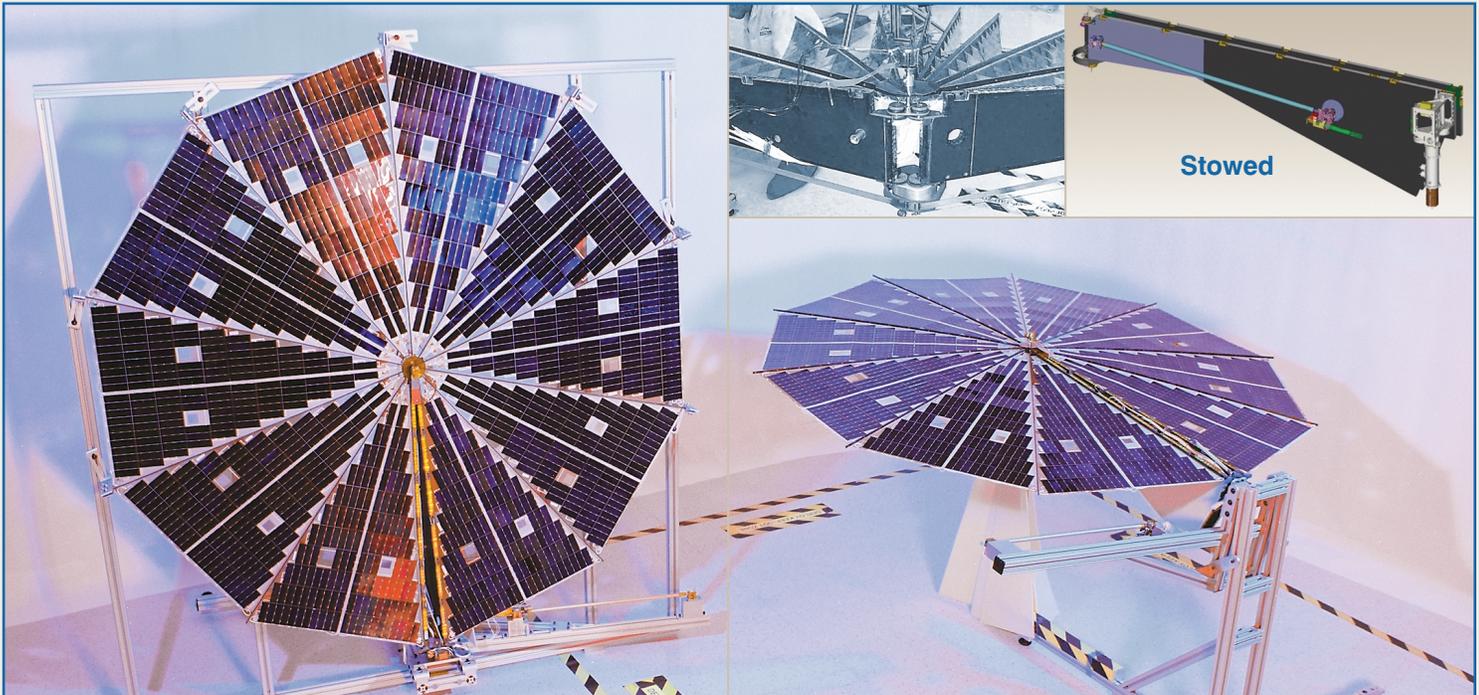


UltraFlex Solar Array

Enabling Light Weight Low Volume Technology



Ideal for LEO, GEO, Interplanetary & Planetary Lander Missions

Performance Features

- Specific performance with 27% TJ cells:
> 150 W/kg BOL & > 40 kW/m² BOL
- Ultra-lightweight: < 25% weight of standard arrays
- Extremely low stowage volume:
< 25% volume of standard arrays
- High deployed stiffness & strength:
> 0.5 Hz demonstrated on Mars '01 Lander
Tensioned blanket/structure forms shallow umbrella deployed shape
- Flight proven low-shock tiedown release
- Qualified stowed packaging system:
Folded gore segments are sandwiched between foam layers in stowed configuration for launch / re-entry protection of cells
- Motor-driven deployment:
staging, unfurling, tensioning & latching operations

Application Benefits

- Extremely light weight allows reduced launch costs and maximizes S/C payloads to increase mission/science return
- High deployment reliability
- Compact stowage volume enables spacecraft and launch vehicle flexibility
- Low deployed mass moment of inertia and high stiffness minimizes attitude & control system (ACS) impacts
- Flexible substrate improves thermal life cycle survivability for long life LEO/GEO missions
- Inherent serpentine string layout accommodates high voltage application
- 1g deployment capable with smaller wings
- Wing sizes up to 15 kW BOL

Qualification Summary

- Materials and designs flight qualified through subsystem coupon/component testing
- Wing level flight-qualification verified in thermal, vibration, and vacuum environments
 - No power degradation observed after full qualification testing
 - No cracked cells observed, and < 1% cracked coverslides occurred
- 2,000 GEO & 17,000 LEO thermal life cycles successfully completed

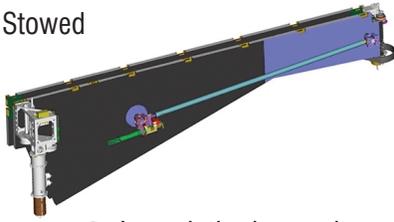
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UltraFlex Deployment Sequence

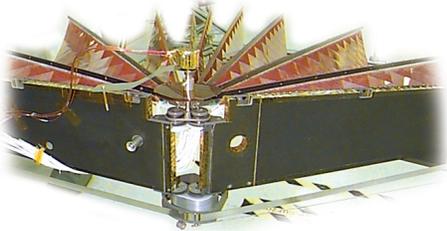
1. Stowed



2. Launch tie-down released, 90° articulation from S/C



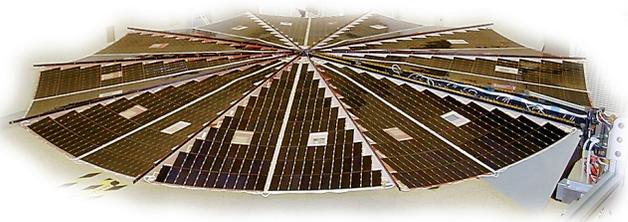
3. Motor-driven deployment, lanyard is attached to pivot panel & reeled onto motor pulley



4. Deployment continues as lanyard is further reeled onto motor pulley; operation continues until pivot panel has rotated ~360°.



5. Fully deployed, preloaded & latched



Applications & Heritage

Program	Customer	Hardware Description	Heritage Level
Mars 01-Lander	JPL & Lockheed Martin Astronautics	Qty=2 Flight Wing Systems with HES PV (2.1m Diameter)	Flight wing systems successfully completed broad qualification testing & delivered
Mars 01-Lander	JPL & Lockheed Martin Astronautics	Qualification Panel with HES PV	Successfully completed mission thermal life cycle testing (200 cycles from -140°C to +80°C)
GPM	NASA GSFC	Qty=1 Panel Coupon with TJ PV	Successfully completed LEO mission thermal life cycle testing (17,000 cycles from -90°C to +100°C)
INSIDE Jupiter	Ball Aerospace	Qty=1 Panel Coupon with TJ PV	Successfully completed deep interplanetary mission thermal vacuum life cycle testing (5 cycles from -110°C to -240°C)
Wake Shield 04	NASA JSC	Qty=2 Flight Wing Systems with SJ PV (3.2 m Diameter)	Completed design of deployable/retractable system. Program postponed indefinitely due to NASA funding.
ABLE IR&D	ABLE	Qty=1 Qualification Wing System with BSFR PV (3.2 m Diameter)	Successfully completed broad wing-level qualification test sequence with no electrical or mechanical degradation
ABLE IR&D	ABLE	Qualification Panel with BSFR PV	Successfully completed GEO mission thermal life cycle testing (1,650 cycles from -150°C to +100°C)